ANXIETY, INTROVERSION, AND EMOTIONAL RESPONSIVENESS

By

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INTRODUCTION

According to Hull (13, 14), the excitatory or reaction potential, E, of a learned response may be mathematically described as a multiplicative function of the number of reinforced occurrences of the response, H; the drive operating during the learning process, D; the intensity of the conditioned stimulus, V (the stimulus intensity dynamism which hypothetically includes the intensity of the neural response to the conditioned stimulus); and the reward characteristics, K. Thus the resulting equation is $R = f(E) = f(H \times D \times V \times K)$. This basic equation has been somewhat modified and extended in the theoretical and experimental work of Spence, his colleagues and students. Hull, for example, defined D in terms of primary needs and the drive stimuli and inanition which they produce; and in the observation that "Some drive conditions tend partially to motivate into action habits which have been set up on the basis of other drive conditions" (13, p. 7), Hull (taken literally) provides only for a limited and partial generalized effect of D. Spence, however, broadly interprets this statement as follows: "The concept of drive, D, is conceived by Hull as a nonspecific or general condition of the nervous system to which all the specific needs contribute" (28, p. 249).

Spence (29, 30) has also elaborated the construct of a hypothetical emotional response mechanism, r_e, defined as the internal response to an emotional (aversive) stimulus. By analogy with overt reflexes, the stimulus for r_e may be either unlearned or conditioned, and the magnitude of

r_e will vary both with the intensity of the stimulus and with individual differences in emotional responsiveness. In the context of Spence-Hull theory, the level of generalized drive, D, is assumed to be a positive function of the level of r_e. Thus the elicitation of r_e's in unselected Ss should raise their D-level; conversely, Ss selected for high and low emotional responsiveness should differ in performance by virtue of differing levels of D. Experiments testing the predictions of this emotionally based drive theory have variously defined r_e in terms of (1) scores on the Taylor Manifest Anxiety Scale (6, 29, 32, 33, 34, 37, 38, 40); (2) intensity of the unconditioned stimulus (26, 36); and (3) various physiological indices including muscle-action potential, heart rate, and the PGR (24, 25). In the conditioning studies, the aversive stimuli have, of course, been externally administered; in the verbal learning studies they are, presumably, internal to the S, autonomously generated as a function of being in a test situation. At least, the verbal materials to be learned are not intended as stimuli for r_e.

Words, however, may be conditioned stimuli for emotional responses, and this suggests that it would be interesting to vary the verbal materials to be learned along this dimension. Reasoning from Hull's basic equation for a learned response, $R = f(E) = f(H, D, V, K)$, the strength of a conditioned r_e to a particular word should be a function of H (the number of reinforced occurrences of the conditioned r_e), D (generalized drive level at the time of presentation of the word), V (the intensity of the neural response to the conditioned stimulus, the word), and K, the reward characteristic. "Reinforcement" in the learning of word meanings (of which conditioned r_e's are presumably a part) is difficult to define objectively:

it seems likely that it has to do with intangible social rewards which cannot be measured as one may weigh out grams of food. This aspect of H, and the factor K, have entered so extensively into the learned verbal behavior of American Ss with common English words that these two factors may, presumably, be considered equal or random in their effects. There is, however, another aspect of H which may be relevant. As Spence, Haggard, and Ross have shown the intensity of the UCS during the learning process contributes directly to the habit strength, H, of a conditioned response (35). The factor V, stimulus intensity dynamism, conventionally defined as physical intensity of the conditioned stimulus, is not relevant here since words do not have physical intensities. (A possible way in which V may enter will, however, be suggested in the discussion section of this paper.) Thus one arrives at the following equation for the strength of an emotional response conditioned to a word: $R = f(E) = f (H \times D)$. From this equation one may derive the prediction that in a comparison of the overt response strengths of "emotional" and "nonemotional" words (those which are associated with conditioned r_e's and those which are not), "emotional" words should exhibit higher response strength. The factor D should theoretically contribute to the response strengths of both types of words, while the response strengths of "emotional" words may receive additional increments either from H or D or both. Thus from Spence-Hull theory may be derived the prediction that, all other things equal, "emotional" materials will be better recalled than "nonemotional."

This is what is generally found in the literature on the effects of "affective" materials; see, for example, Koch (16); Dysinger (3); Silverman and Cason (27); Menzies (21); Carter (2); and Lanier (17, 18).

Some of these studies used both the PGR and judges' and/or Ss' ratings as indices of affectivity of the material, while others used ratings alone. Whatever the index, however, all found "emotional" materials better recalled than "nonemotional"; it may be noted here that in a review of studies investigating the relation of PGR to Ss' ratings of the emotional intensity of words, McCurdy (20) concluded that the finding of a significant positive relation was one of the most reliable in psychology. The observation is of special interest here since PGR has been considered one of the operational definitions of r_e. Particularly pertinent is Osgood's comment: "Words yielding high PGR values generally show better retention . . . PGR measures merely the presence of emotional excitement, not its quality" (23, p. 572).

These older studies raise a most interesting question with regard to the conceptual definition of r_e as "response to an aversive stimulus." The investigators were interested in the effects of "pleasantness" as well as of "unpleasantness." With the exception of Lanier, who found largest PGR and best retention for materials of "mixed" (both pleasant and unpleasant) rating, the finding commonly reported has been that "pleasant" materials are best retained, and "unpleasant" next (with no significant difference between them), either being superior to "indifferent." Menzies, Waters and Leeper (42), and Turner and Barlow (38), in fact concluded that intensity of feeling, not its hedonic quality, was the important factor in superior retention, a conclusion which seems in good agreement with the Osgood statement quoted above. Additional evidence that intensity of response need not be a matter of aversiveness is found in a particularly interesting study by Bingham (1). He had 50 Ss rate 72 highly abstract words for personal meaningfulness, significance, and importance (MSI) and obtained PGR's to these words. Words having high MSI also had high PGR; examples are intellectual, freedom, God, truth, and love. Commenting on this study, Osgood (23, p. 701) observes that "it is not inconceivable that . . . the affective, connotative aspects of meaning are mediated by the autonomic system. . . ." Thus (at least in the realm of symbolic behavior) it seems reasonable to define r_e more generally as the response to an emotional stimulus, whether "pleasant," "aversive," or "mixed."

The possibility that there are individual differences in such general emotional responsiveness is at once apparent. It is also possible that there are individual differences in relative responsiveness to emotional stimuli with respect to differences in hedonic quality. The question at once arises whether high-anxiety Ss are generally emotionally responsive, or whether they over-respond only to aversive stimuli.

A related question received its impetus from Eysenck's (4) suggestion that "anxiety" may be confounded with "introversion" in the conditioning results reported by Spence, Taylor, and others of the Iowa group. These findings have been that high-anxious Ss condition more rapidly and strongly than low-anxious Ss, in accordance with prediction from emotionally based drive theory. Parallel results have been reported for conditioning comparisons of introverts and extraverts (8, 9, 10) as defined by scores on the Guilford R Scale (11, 12) or its derivative, the extraversion scale of the Maudsley Personality Inventory. Franks found superior conditioning of introverts to hold whether or not introverts were also "anxious." In terms of Hullian theory, then, introverts empirically exhibit higher excitatory potential, E, related either to higher

H, to higher D, or to both. Linking Hullian theory with his own excitation-inhibition theory, Eysenck assumes that the higher E represents a constitutional difference in excitation-inhibition balance which leads to a more rapid growth in H. Introvert-extravert differences in D defined as "emotional responsiveness" are rejected. However, it is interesting to note that this rejection logically depends on the definition of "emotional responsiveness" as "responsiveness to aversive stimuli." In Eysenck's system, this corresponds to the "neuroticism" factor, which he has found to be independent of the introversion-extraversion factor. On the other hand, if a constitutionally higher E is assumed, then on Hull's theory the strength of all learned responses, including emotional responses, should be increased. Thus the theory leads in spite of all other considerations to the prediction that introverts are more emotionally responsive than extraverts. Again it is immediately apparent how these hypothetically more intense emotional responses, made as a function of higher E, might contribute to additional learning via either H or D. Thus the prediction would be that in a comparison of introverts and extraverts, introverts should show relatively superior performance on words which elicit emotional responses. And since R is a general term implying nothing about aversiveness of the stimulus, the prediction would be for general emotional responsiveness; introverts compared with extraverts should over-respond to any emotional stimulus, whether "pleasant" or aversive.

Thus the hypothesis may be stated that introverts are more generally emotionally responsive, and the question raised whether high-anxious Ss are also more generally emotionally responsive. Spence refers to them in an unqualified way as "emotionally responsive"; his theory, however, requires only that they over-respond to aversive stimuli.

The relation of general emotional responsiveness to introversion and anxiety was investigated in a small pilot study (22). The learning task consisted of an individually constructed list, made up of ten emotionally rated (both pleasant and unpleasant) and ten nonemotionally rated items, randomly assorted. No significant difference in retention of emotional and nonemotional items was found for any group when the total recall lists were considered. However, when the top half only of the lists was considered, there was significant evidence that emotional items were higher in the response hierarchy of introverts ($p < .01$), thus indicating a relation between general emotional responsiveness and introversion. On the other hand, no significant evidence of a relation between general emotional responsiveness and anxiety was found in this study.

The basic hypothesis of the present research may now be stated: there are two kinds of emotional response mechanisms, one general and one specific. The former consists of relative over-response to all kinds of emotional stimuli, both pleasurable and aversive, and is related to introversion (as defined by R Scale scores). The latter consists of relative over-response to aversive stimuli only, and is related to anxiety (as defined by scores on the Taylor MAS). Specifically, in a learning task including pleasurable, aversive, and nonemotional items, introverts as compared with extraverts should show relatively higher response strength to both pleasurable and aversive items; high-anxious Ss as compared with low-anxious Ss should show relatively higher response strength to aversive items only. The terms "high-anxious" and "introvert" are here intended in an operational sense only. The adequacy of these two tests to measure validly such global constructs as "anxiety" and "introversion" is, of course, open to question.

The learning task should, however, be incidental rather than intentional as in the pilot study. There are two reasons for this. The first is that the intentional learning task creates a set to learn all possible items, and this might operate to obscure differences in regard to emotional items which might otherwise appear. The second is that instructions to learn presumably cause high-anxious Ss to generate aversive r_e's as a function of being in a test situation. These emotional responses are elicited by the situation rather than by the material, and so would introduce error into the intended index of emotional responsiveness.

A series of three studies testing these hypotheses has been carried out.

METHOD

Subjects

Subjects were drawn entirely from introductory classes in general psychology and personality adjustment. The majority were encouraged to volunteer by awarding points for participation.

Test Materials

Each S received a mimeographed test booklet (see Appendix I) consisting of the R Scale from Guilford's Inventory of Factors STDCR (11), the Manifest Anxiety Scale (39), and an ostensible personality test labelled Feeling Scale. The latter consists of 105 verbal items (words or phrases) referring to various kinds of objects, experiences, situations, concepts, etc. Instructions were to rate each item on a 5-point scale ranging from _1_ (extremely strong feeling) to _5_ (no feeling); that is, to rate for intensity, _not_ _kind_, of associated feeling. (Items such as "We hold these truths . . . ," "Seeing an animal mistreated," "The kickoff," "Final exams," often received _1_ ratings; items such as "Dustmops," "A pair of galoshes," "Straight chairs," were usually rated _5_. Many items, e.g., "Modern art," "A Beethoven symphony," "A lecture on economics," received strong ratings from some Ss, weak ones from others.) Instructions for the R Scale and the MAS were identical with the originals except that MAS instructions were modified for use with True-False rather than Yes-No responses.

Procedure

Basic test procedure consisted of two sessions; in the first, the S completed the test booklet, while in the second he participated in the incidental learning task. For this, he was instructed to take his completed test booklet, turn again to the Feeling Scale, and go over the items once more. This time he was to mark them for kind of associated feeling; P if the feeling were pleasant (liking, enjoyment, approval, etc.) and N if it were unpleasant. Items neither pleasant nor unpleasant were to be left blank. Test booklets were then taken up (Experiment I) or turned face down (Experiments II and III). Instructions then were given to write down all items from the Feeling Scale which could be recalled, their order being of no importance. The immediate effect was, apparently, one of complete surprise; at any rate there were outcries of consternation. It was emphasized that the Ss must begin to write and stop writing instantly on signal from the E. Ten minutes recall time was allowed. The data were then taken up, and before the Ss were dismissed it was explained to them that the experiment was being conducted in other classes, and that if this part of the procedure "got out" the work would be spoiled, and so it would be very much appreciated if they would keep the secret. It is believed that for the most part they complied; at least, in all classes tested, the instructions appeared to take the Ss by surprise.

There were some variations within this basic procedure among the three studies; these variations are reported separately as follows:

Experiment I

Ss were 140 members of a class in personality adjustment. Test booklets were filled out during a regular class session. Following this the

Ss responded to a Self-Experience Report designed by their instructor for his own research. Because his research required correlation between R Scale scores and self-experience responses made under anonymous conditions, test booklets were initially identified only by number. In order to award points for participation, however, the Ss were required at the second session to put their names on the booklets. Immediately following the incidental learning task, data was gathered on intentional nonsense syllable learning by the group, for reasons of general interest, not intrinsic to the present research, and therefore not reported here. The time interval between the first and second sessions was approximately one month.

Experiment II

Ss were 178 members of four sections, two of introductory general psychology, and two of personality adjustment. In one section, booklets were filled out in regular class session; in the remainder, they were distributed in class and completed at home. Names were recorded on test booklets at the outset. Ss belonging to the two introductory general sections were rewarded with points for participation; those from the introductory adjustment classes were not, in accordance with the wish of their instructor. The nonsense syllable task was included in this experiment also. The time interval between distribution of test booklets and the second session was one week or less.

Experiment III

Ss were 88 members of introductory general and adjustment courses, the majority from the former. Test booklets were distributed in class and completed at home. Names were required on test booklets. At the second session, in advance of the re-rating and incidental learning task, Ss were required to respond to the Cattell 16 Personality Factor Inventory, and to rate themselves on a simple introversion-extraversion rating scale, in order to afford a basis for investigation of the relation between these measures of introversion-extraversion and the R Scale.* All Ss were awarded points for participation. The interval between distribution of test and second session was five days. In this experiment the second session had to be scheduled in the evening. Nonsense syllable learning was not included in this study.

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*This investigation is a separate question and will not be reported here.

RESULTS

Four hundred and six Ss participated in the personality testing. Twelve of these were rejected at the outset for one of the following reasons: defective test booklet (1); language difficulty (1); duplication (1); questionable R Scale score (3); omission by S of one or more pages of a personality test (6). Of the remaining 394, 356 participated in the incidental learning task. For the comparisons of response strength on emotional and nonemotional materials ten more were discarded for reasons distributed as follows: questionable Feeling Scale ratings (3); P-N ratings absent or incomplete (5); observed recall score of zero on both emotional and nonemotional items (2). Extreme personality groups for these comparisons were therefore drawn from the remaining pool of 346 Ss; while the investigation of possible confounding between the R Scale (hereafter called R) and the Manifest Anxiety Scale (hereafter called A) is based on the scores of the 394 Ss acceptably completing both of these tests.

The Confounding Question

The correlation between R and A was found to be -.27, significant beyond the .01 level, but not high enough to be very informative. However, on the Eysenck theory, it would not be expected that excitatory potential would greatly predominate over inhibitory, and vice versa, except at the extremes of the introversion-extraversion continuum. The confounding question is therefore the question whether extreme introverts (designated High-In) and extreme extraverts (High-Ex) respectively predominate in

High-A and Low-A groups as these have usually been defined in the Iowa researches. High-In and High-Ex groups are defined throughout the present paper by R scores of 25 or below, and 49 or above, respectively. These cut-off points are approximately ± one S.D. from the R mean of the total sample, and yield groups of nearly equal size in the total pool. In the Iowa studies, High-A and Low-A groups have usually been defined as the top and bottom 20 per cent of A-scores. In the present sample, this percentage is most closely approximated by A-scale cut-off points of 22 or above (High-A) and 7 or below (Low-A). The distribution of R with respect to A in accordance with these two sets of cut-off points is shown in Table 1. The distribution has a chi-square of 27.17, which, with four degrees of freedom, is significant at beyond the .001 level. The largest contribution to chi-square is made by the High-A-High-In cell, in which the observed frequency is twice the expected. If it is assumed that the effects of relative differences in introversion-extraversion will tend to balance each other in the midrange of R, then it is quite clear that the hypothetical effects of High-In could easily outweigh those of High-Ex in the High-A group. The reverse situation holds, though to a less marked degree, in the Low-A group. This view, however, presupposes that anxiety itself has no effect independently of introversion, a view that Eysenck would surely reject. If it does, then it is worth noting that 66 per cent of this High-A sample are _not_ High-In, a proportion which might well outweigh the hypothetical effect of High-In. Thus it appears that even though confounding may be theoretically present at a very high level of statistical significance, the question whether a given _result_ is actually due to this confounding would have to be decided on other grounds. It is, at any rate, clear that the interpretation of results of research with either or both of these two scales should take this question of confounding into account.

TABLE 1

DISTRIBUTION OF R WITH RESPECT TO HIGH-, MIDRANGE-, AND LOW-A AS DEFINED IN THE IOWA RESEARCHES

	R-Scores			
	High-In (25$^-$)	Midrange (26-48)	High-Ex (49+)	Total
High-A (22+)	29 (14.4)	51 (57.4)	6 (14.2)	86
Mid-A (8-21)	31 (39.0)	159 (155.5)	43 (38.4)	233
Low-A (7$^-$)	6 (12.6)	53 (50.1)	16 (12.4)	75
Total	66	263	65	394

$X^2 = 27.17$, $p < .001$.

Treatment of Learning Data

The criterion of retention of an item was not verbatim reproduction but meaning. Thus "spider legs" was acceptable for "hairy spider legs," but "spiders" or "spider webs" was not. Similarly, "blind person" was accepted for "eyeless person" and "integration" for "integrated schools," while "mutilated people" and "segregation" would be rejected. A response given by several Ss which was considered correct even though the words themselves were all different was "someone else's humiliation" for "another person's embarrassment." On this criterion the ranges of scores in the three studies were: Experiment I, 3-51; Experiment II, 9-61; Experiment

III, 6-39. The respective means were 28.3, 29.4, and 20.3. The means of Experiments I and II are not significantly different; each, however, differs from the Experiment III mean at the .001 level.

Incidental Learning

The relation of incidental learning scores (total number of items recalled irrespective of ratings) to personality test scores is not of primary interest to the present study. Nevertheless, these relationships were carefully examined in order to determine whether the data of the three studies might legitimately be pooled for the analyses investigating the basic hypotheses. Pooling was important for most efficient use of the data, since the three samples were quite different with respect to the frequencies of Ss falling at or beyond specified cut-off score levels for extreme personality groups. However, there was a priori doubt of its legitimacy for two reasons: (1) the procedural variations described above; and (2) the highly significant difference in incidental learning means between Experiment III and either of the two other experiments. This difference is not by itself a decisive reason against pooling, since the investigation of relative recall of emotional and nonemotional items requires the use of ratio scores (the reasons why and the method of derivation will be detailed below) and this type of score is independent of list-length per se. On the other hand the factors causing this difference might also be associated with differences in learning-personality relationships (and in fact differences of this kind might be present even without significant differences in total incidental learning means). The question of the legitimacy of pooling therefore hinges on this point. As Lindquist (19, p. 132) observes, "The real question, then, is not 'Do the populations differ?', but 'Do they differ with respect to anything which interacts with the experimental factor?'"

The incidental learning scores of the experimental groups within each experiment were therefore examined to determine whether such interaction was present. Extreme R-groups were defined by R scale scores of 25- (High-In) and 49+ (High-Ex), as previously noted. Extreme A-groups were defined by A scale scores of 25+ (High-A) and 5- (Low-A); these cut-off points are more extreme than those ordinarily used by the Iowa group, and should yield even more clear-cut results. However, in order to obtain equal frequencies for comparison groups within experiments, it was necessary to resort both to random discards and to random selection from adjacent score levels.

The incidental learning means of the extreme personality groups so composed are shown in Tables 2 and 3. It may be seen in Table 2 that the anxiety-group differences are in opposite directions for Experiment I as against Experiments II and III, but that these variations are in themselves quite small. In Table 3, on the other hand, there is a consistent tendency for High-Ex incidental learning scores to be higher than High-In in each experiment.

Results of analyses of variance of these scores are summarized in Tables 4 and 5. In both tables, the only effect reaching the .05 level of significance is Replications. The effect of In-Ex (Table 5) approaches but does not reach significance, with a probability between .05 and .10. In both tables, the interaction between the personality variable and experiments yields an F less than 1.00, completely insignificant. From these findings it appears that pooling is legitimate.

TABLE 2

INCIDENTAL LEARNING MEANS OF HIGH-A AND LOW-A SUBJECTS

Experiment	Cut-Off Points	High-A	Low-A	Total
I	25+, 7-	27.0	29.1	28.05
(N)		(17)	(17)	
II	25+, 5-	28.0	27.4	27.70
(N)		(21)	(21)	
III	24+, 5-	21.7	20.1	20.90
(N)		(10)	(10)	
Total		26.3	26.5	26.41

TABLE 3

INCIDENTAL LEARNING MEANS OF HIGH-IN AND HIGH-EX SUBJECTS

Experiment	Cut-Off Points	High-In	High-Ex	Total
I	25-, 49+	24.6	28.5	26.6
(N)		(14)	(14)	
II	25-, 49+	30.4	32.5	31.4
(N)		(19)	(19)	
III	25-, 56+	20.8	24.8	22.8
(N)		(8)	(8)	
Total		26.5	29.6	28.0

TABLE 4

ANALYSIS OF VARIANCE OF INCIDENTAL LEARNING SCORES
OF EXTREME A-GROUPS, THREE EXPERIMENTS

Source	df	SS	MS	F	p
Replications	2	768.5	384.25	5.27	$< .05$
Anxiety	1	.5	.50	< 1.00	
R x A	2	54.4	27.20	< 1.00	
Error	90	6565.8	72.95		
Total	95	7389.2			

TABLE 5

ANALYSIS OF VARIANCE OF INCIDENTAL LEARNING SCORES
OF EXTREME R-GROUPS; THREE EXPERIMENTS

Source	df	SS	MS	F	p
Replications	2	948.6	474.3	8.15	$< .01$
In-Ex	1	193.7	193.7	3.33	$< .10$
R x In-Ex	2	16.1	8.0	< 1.00	
Error	76	4423.1	58.2		
Total	81	5581.9			

There remains, however, one other possible source of evidence of differences in personality-learning relationships in the three studies, which is suggested by comparison of the incidental learning general means of the three studies with the means reported in Tables 2 and 3. The general means were: Experiment I, 28.3; Experiment II, 29.4; Experiment III, 20.3. That the extreme personality group means may vary in different ways from these general means is most apparent from inspection of Table 3, which shows that in Experiment I the incidental learning mean of the extreme R groups is lower than the general mean of that study, while in Experiments II and III the reverse is true. These internal relationships suggest that there may be a U-shaped relation between R scale scores and incidental learning in Experiments II and III, a relation which appears to be reversed in Experiment I. This might, of course, be merely a result of unreliability of means; random discards to achieve equal frequencies for comparison groups had reduced sample sizes. The point was checked by tabulation of the frequencies of incidental learning scores of all Ss in extreme R groups in each experiment falling above and below the incidental learning mean of all other Ss in that experiment. The distribution is shown in Table 6. It yields a X^2 of 9.05, which with 2 df is significant between the .02 and .01 levels. Although inspection indicates that the major contribution to X^2 comes from Experiment I, separate comparisons of each experiment with every other were then computed. These showed that Experiment I differed from Experiment II in this respect at beyond the .01 level, and from Experiment III at beyond .05, while Experiments II and III were not different from each other (X^2 = .29). Thus it appears that Experiments II and III do not differ in the relation between incidental learning and R Scale scores, and that these data may legitimately be pooled; but that including Experiment I in the pool would be somewhat questionable.

TABLE 6

COMPARISON OF INCIDENTAL LEARNING SCORES OF EXTREME R-GROUP Ss WITH MEAN INCIDENTAL LEARNING OF Ss IN THE MIDRANGE OF R

Experiment	Above Mean	Below Mean	Total
I	10 (17.3)	22 (14.7)	32
II	31 (26.0)	17 (22.0)	48
III	17 (15.7)	12 (13.3)	29
Total	59	50	109

$X^2 = 9.05,\ .02 > p > .01$

A parallel tabulation was then made for the extreme A-groups (Table 7). The distribution yields a X^2 of 1.98, with an insignificant probability between .50 and .30. Chi-squares comparing the individual experiments also yielded insignificant results. It appears therefore that the anxiety-incidental learning relationships are not significantly different in the three studies, and thus from the standpoint of this variable all data might be pooled.

Thus, no analysis indicates that the data of Experiments II and III may not be pooled, while one suggests that Experiment I should not be. It was therefore decided that the data should be analyzed both ways, and that the pooled data would be presented if this procedure yielded the most conservative results. However (as will be shown), while pooling all data yields a conservative estimate of the relation between introversion and recall of emotional materials, it enhances the results with respect to anxiety. Presumably this is what would be expected if the procedural variations of Experiment I significantly affected the relation of incidental learning to one personality variable, but not to the other (as the analyses presented above suggest). It was decided therefore to present both sets of results.

TABLE 7

COMPARISON OF INCIDENTAL LEARNING SCORES OF EXTREME A-GROUPS WITH MEAN INCIDENTAL LEARNING OF Ss OF MIDRANGE A

Experiment	Above Mean	Below Mean	Total
I	13 (12.6)	10 (10.4)	23
II	23 (25.7)	24 (21.3)	47
III	11 (8.7)	5 (7.3)	16
Total	47	39	86

$X^2 = 1.98,\ .50 > p > .30$

Derivation of Scores

Two hypothetical kinds of emotional responsiveness are to be investigated: (1) general emotional responsiveness, defined as relative over-response to any kind of emotional stimulus, "pleasant" or aversive, a function of intensity only (hypothesized as related to R); and (2) specific emotional responsiveness, defined as relative over-response to aversive stimuli only, a function of both intensity and quality (hypothesized as related to A). Two types of measures are therefore required, one based on intensity only, and one based on both intensity and quality.

Relative emotional responsiveness of either kind is to be inferred from relative response strength to emotional and nonemotional stimuli. "Emotional stimuli" are here defined as those verbal items rated *1* (extremely strong feeling) on the Feeling Scale by the individual S. "Nonemotional stimuli" are similarly defined as items rated *5* (no feeling). These ratings refer to intensity only, not quality; response strength to items so rated is therefore one measure of general emotional responsiveness. Items rated *1* may also be considered in terms of the later ratings of *P* (pleasant) and *N* (unpleasant). Thus a "pleasant" emotional stimulus is an item rated both *1* and *P*; and an "aversive" emotional stimulus is an item rated *1* and *N*. Response strength on both kinds of items as compared with nonemotional items is an additional measure of general emotional responsiveness; it also affords an index of specific emotional responsiveness. The basic measures therefore have to do with relative frequencies in the recall lists of items rated *1* (and later rated *P* or *N*) and items rated *5*.

It is clear, however, that a simple count of frequencies would not provide an adequate measure. This follows from the fact that there was great individual variation both in frequency of use of 1 ratings on the Feeling Scale (the actual range was 0-61) and in total number of items (however rated) incidentally recalled (the actual range of length of recall list was 3-61). For example, consider the hypothetical cases of Subject A and Subject B. Subject A assigns a rating of 1 to 21 of the 105 items on the Feeling Scale; he therefore has rated 20 per cent of the items as "emotional." Subject B on the other hand uses a 1 rating 42 times; 40 per cent of the items are "emotional." Subject A then reproduces 20 items on his recall list; 8 of these (40 per cent) are items he previously rated 1. B, however, reproduced 40 items, of which 16 (again 40 per cent) are items he had rated 1. A simple count of frequencies would indicate that B's emotional recall score is twice as high as A's. That this would be a spurious index of response strength on items rated 1 is immediately apparent from the fact that A has actually recalled twice as many "emotional" items as would be predicted from the proportion of his ratings; whereas the number recalled by B exceeds this prediction not at all. Thus it is clearly necessary to derive a score which takes both factors (individual differences in rating and in recall list length) into account. The ratio score of observed to expected frequency fulfills both requirements.

To return to Subject A, then, his emotionsl recall or E-score (the score from which general emotional responsiveness is to be inferred) is calculated as follows. First, the percentage of 1 ratings is computed; this, multiplied by the total number of items on the recall list, yields the expected frequency of E-items recalled. The ratio of this figure to the observed frequency of E-items in the recall list yields the final E-score. For Subject A, the figure would be (.20) (20) = 4 (expected frequency); since the observed frequency is 8, Subject A has an E-score of 8/4 = 2. The same procedure with Subject B's data yields an E-score of 1. Since, however, these computations most often yield decimals (e.g., 1.1, 1.8, etc.), for simplicity's sake the scores are transformed by a factor of ten, so that Subject A's final E-score is 20, and Subject B's is 10. Identical calculation procedures for items rated 5 (no feeling) yield the nonemotional recall or N-score for each S. It will be noted that an E- or N-score of 10 indicates that the observed frequency equals (or approximates within the rules for rounding) the expected frequency; while scores above or below this figure, if sufficiently consistent within a group, would indicate that some factor or factors, other than individual differences in the use of ratings and in recall list length, may be operating to affect recall of these items.

The same principles are followed in the computation of the scores from which specific emotional responsiveness is to be inferred. It will be recalled that "pleasant" emotional items are those rated both 1 and P; "aversive" emotional items are those rated 1 and N. The expected E-score, as explained above, must therefore form the basis of computation of P- (pleasant) and U- (unpleasant) scores. (Use of the observed frequency of E-items recalled would ignore the important considerations outlined above.) Returning to Subject A, then, his expected E-score is 4. Further reference to his Feeling Scale shows that of the items rated 1, 8 (38 per cent) were also rated P, while 13 (62 per cent) were rated N. His expected P-score is therefore (.38)(4) = 1.5; his expected U-score is (.62)(4) = 2.5. Of the 8 observed E-items in his recall list, it is found that 4 had been rated P, while the other 4 had been rated N. His P-score is therefore (4/1.5)(10) = 27; while his U-score is (4/2.5)(10) = 16. Subject A therefore recalls proportionately more of each kind of emotional item than would be expected; but he appears to have higher response strength on items rated P than on items rated N (unpleasant).

E- (general emotional), N- (nonemotional), P- (pleasant), and U- (unpleasant) scores were calculated for each S belonging to an extreme personality group as defined by A and R scores. A few Ss used no 1 ratings, and a few used no 5's. In these cases, E- and N-scores were computed on a basis of 2 (strong feeling) or 4 (little feeling) ratings. On the other hand, if 1 and 5 ratings had both been used, but the observed E- and N-scores were both zero, that S was discarded.

Comparison of Response Strength of Emotional and Nonemotional Items

The means reflecting response strength on E (general emotional) and N (nonemotional) items, for extreme A groups, are presented in Table 8.

TABLE 8

RESPONSE STRENGTH OF HIGH-A AND LOW-A GROUPS ON E (GENERAL EMOTIONAL) AND N (NONEMOTIONAL) ITEMS

Experiment	High-A			Low-A		
	(n)	E	N	(n)	E	N
I	(17)	15.3	8.5	(21)	15.0	7.5
II & III	(27)	14.7	7.4	(36)	18.8	10.3
I, II & III	(44)	14.9	7.8	(44)	18.2	9.8

The Low-A group for Experiment I includes all Ss with A scores of 7 and below; in this study, only 6 Ss fell at or below the Low-A cut-off score of 5. The pooled Low-A mean for all three studies does not, however, include all the Experiment I Ss with A scale scores of 6 and 7. The cut-off score of 5 was used for the pooled data, two vacancies being filled by arbitrary selection of the two most introverted Ss with A scores of 6 in the total pool.

Two interesting findings are apparent in these means. The first is that Ss of both groups are "generally emotionally responsive"; that is, both groups relatively over-respond to emotional items (pleasant or unpleasant character disregarded) as compared with nonemotional items. This finding agrees with the results of other investigations previously referred to. The second point of interest is that Low-A Ss are apparently more generally emotionally responsive than High-A Ss.

Results of analyses of variance of these scores are summarized in Tables 9, 10, and 11.

TABLE 9

ANALYSIS OF VARIANCE OF E- AND N-SCORES OF EXTREME A GROUPS, EXPERIMENT I

Source	df	SS	MS	F	p
Between					
A	1	7.9	7.9	< 1.00	
Error (b)	36	1053.1	29.25		
Within					
E-N	1	987.9	987.9	27.07	$< .001$
E-N x A	1	2.2	2.2	< 1.00	
Error (w)	36	1313.9	36.5		
Total	75	3365.0			

TABLE 10

ANALYSIS OF VARIANCE OF E- AND N-SCORES OF EXTREME A GROUPS, EXPERIMENTS II AND III

Source	df	SS	MS	F	p
Between					
A	1	375.0	375.0	5.20	< .05
Error (b)	61	4399.7	72.13		
Within					
E-N	1	2000.0	2000.0	25.93	< .001
E-N x A	1	8.4	8.4	< 1.00	
Error (w)	61	4704.6	77.12		
Total	125	11487.7			

TABLE 11

ANALYSIS OF VARIANCE OF E- AND N-SCORES OF EXTREME A GROUPS, THREE EXPERIMENTS POOLED

Source	df	SS	MS	F	p
Between					
A	1	295.8	295.8	4.79	< .05
Error (b)	86	5307.1	61.71		
Within					
E-N	1	2632.7	2632.7	39.48	< .001
E-N x A	1	27.9	27.9	< 1.00	
Error (w)	86	5735.4	66.69		
Total	175	13998.9			

In all three analyses, the difference between emotional and non-emotional items is significant beyond the .001 level. The significant difference between A groups found in the pooled data of Experiments II and III (Table 10), and of all three studies (Table 11), means only that Low-A groups recalled proportionately more of both E and N items than the High-A Ss, not that they had superior total scores (it was shown in Table 4 that they did not). It may be recalled here that these analyses deal only with the two extreme categories (items rated 1 and items rated 5) from five possible emotional intensity categories (which would include items rated 2, 3, and 4). F-tests of the difference between E-means only, High-A and Low-A groups, yielded insignificant results for Experiment I, a probability between .20 and .10 for Experiments II and III pooled, and for the total pool a probability between .10 and .05. Although this finding does not reach the .05 significance level, it is nevertheless interesting. It is at any rate safe to conclude that High-A Ss are not more generally emotionally responsive than Low-A; such evidence as there is in the opposite direction. It may also be noted that while this effect is not apparent in Experiment I considered alone, the inclusion of its data in the pool does raise the significance level of the difference between the High-A and Low-A E-means.

The means reflecting response strength on P (pleasant emotional) and U (unpleasant emotional) items for the High-A and Low-A groups are shown in Table 12. (As before, the Experiment I Low-A group includes Ss with A scores of 6 and 7.)

It is of very great interest to note from these means that the apparent relative deficit of High-A Ss in "general emotional responsiveness" as inferred from the E-score means shown in Table 8 appears to be due entirely to lowered response strength on unpleasant emotional items. In other words, these means are in direct opposition to the hypothesis being tested; instead of showing relative over-response to the unpleasant items, the High-A Ss appear to under-respond to them.

Results of analysis of variance of these scores are summarized in Tables 13, 14, and 15.

TABLE 12

RESPONSE STRENGTH OF HIGH-A AND LOW-A Ss ON P (PLEASANT EMOTIONAL) AND U (UNPLEASANT EMOTIONAL) ITEMS

Experiment	High-A			Low-A		
	(n)	P	U	(n)	P	U
I	(17)	14.2	12.8	(21)	12.4	16.3
II & III	(27)	14.7	14.7	(36)	15.1	19.1
I, II & III	(44)	14.5	14.0	(44)	14.4	18.8

TABLE 13

ANALYSIS OF VARIANCE OF P- AND U-SCORES OF EXTREME A GROUPS, EXPERIMENT I

Source	df	SS	MS	F	p
Between					
A	1	14.8	14.8	< 1.00	
Error (b)	36	2500.6	69.46		
Within					
P-U	1	45.8	45.8	< 1.00	
P-U x A	1	135.2	135.2	1.22	
Error (w)	36	3986.5	110.74		
Total	75	6682.9			

TABLE 14

ANALYSIS OF VARIANCE OF P- AND U-SCORES OF EXTREME A GROUPS, EXPERIMENTS II AND III

Source	df	SS	MS	F	p
Between					
A	1	176.7	176.7	1.18	
Error (b)	61	9121.2	149.5		
Within					
P-U	1	162.3	162.3	1.69	
P-U x A	1	114.0	114.0	1.19	
Error (w)	61	5850.2	95.9		
Total	125	15424.4			

TABLE 15

ANALYSIS OF VARIANCE OF P- AND U-SCORES OF EXTREME A GROUPS, THREE EXPERIMENTS POOLED

Source	df	SS	MS	F	p
Between					
A	1	262.6	262.6	2.03	.20
Error (b)	86	11111.4	129.2		
Within					
P-U	1	154.6	154.6	1.76	.20
P-U x A	1	248.2	248.2	2.83	.10
Error (w)	86	7554.7	87.8		
Total	175	19331.5			

It is interesting to note that in none of these analyses does the effect of P-U approach the .05 significance level. There is no evidence here that P and U belong to different categories, that is, that one is "emotional" and the other not. The insignificant ($p = .20$) superiority of U in the total pool is due (as reference to the Table 12 means shows) to the relatively higher scores of Low-A Ss on these items. This effect is shown again, and again insignificantly, in the P-U x A interaction in the total pool, which has a probability of .10. Individual F-tests of the difference in U-means only, High-A and Low-A groups, yielded insignificant results for Experiment I; a probability between .20 and .10 for the pooled data of Experiments II and III; and a significant difference ($p < .05$) for the total pool. Again it may be noted that while Experiment I alone is insignificant, its inclusion in the total pool raises the significance level of the difference found.

The results of all these analyses of the relative response strengths of High-A and Low-A Ss to general emotional, nonemotional, pleasant emotional, and unpleasant emotional items, appear to justify two conclusions: (1) that High-A Ss are not more generally emotionally responsive than Low-A Ss; and (2) that their apparent deficit in general emotional responsiveness is attributable to relative under-response on the unpleasant items. This second finding is opposite in direction to that predicted.

The means reflecting response strength on E (general emotional) and N (nonemotional) items for extreme R groups (High-In and High-Ex) are presented in Table 16. R scale cut-off scores of 25- (High-In) and 49+ (High-Ex) apply throughout the table. One High-Ex was randomly discarded from the total pool.

TABLE 16

RESPONSE STRENGTH OF HIGH-IN AND HIGH-EX GROUPS ON E (GENERAL EMOTIONAL) AND N (NONEMOTIONAL) ITEMS

Experiment	High-In			High-Ex		
	(n)	E	N	(n)	E	N
I	(18)	15.7	8.7	(14)	14.6	6.9
II & III	(36)	16.4	8.0	(41)	12.6	11.9
I, II & III	(54)	16.2	8.4	(54)	13.1	10.9

It is evident that High-In's recall proportionately more E-items, and proportionately fewer N-items than do High-Ex's, both in Experiments II and III, and in the total pool. Moreover, the High-In means of Experiment I are not very different from those of Experiments II and III. The High-Ex means of Experiment I are, however, distinctly different.

Results of analyses of variance of these scores are summarized in Tables 17, 18, and 19.

TABLE 17

ANALYSIS OF VARIANCE OF E- AND N-SCORES OF HIGH-IN AND HIGH-EX GROUPS, EXPERIMENT I

Source	df	SS	MS	F	p
Between					
In-Ex	1	31.3	31.3	1.46	
Error (b)	30	643.8	21.46		
Within					
E-N	1	862.9	862.9	17.93	$<.001$
E-N x In-Ex	1	1.7	1.7	< 1.00	
Error (w)	30	1443.9	48.13		
Total	63	2983.6			

TABLE 18

ANALYSIS OF VARIANCE OF E- AND N-SCORES OF HIGH-IN AND HIGH-EX GROUPS, EXPERIMENTS II AND III

Source	df	SS	MS	F	p
Between					
In-Ex	1	0	0		
Error (b)	75	4102.6	54.7		
Within					
E-N	1	707.1	707.1	14.46	< .001
E-N x In-Ex	1	576.9	576.9	11.80	.001
Error (w)	75	3670.0	48.9		
Total	153	9056.6			

TABLE 19

ANALYSIS OF VARIANCE OF E- AND N-SCORES OF HIGH-IN AND HIGH-EX GROUPS, ALL THREE EXPERIMENTS

Source	df	SS	MS	F	p
Between					
In-Ex	1	5.0	5.0	< 1.00	
Error (b)	106	4690.6	44.2		
Within					
E-N	1	1375.1	1375.1	27.27	< .001
E-N x In-Ex	1	419.5	419.5	8.32	< .005
Error (w)	106	5344.9	50.4		
Total	215	11835.1			

As it was with the A groups, the difference between emotional and nonemotional items is again significant at the .001 level in all three analyses. Here again it is apparent that both groups are "generally emotionally responsive"; both High-In's and High-Ex's retain more emotional items, whether pleasant or unpleasant, than nonemotional. But that they are differentially so is quite plain in all analyses except the analysis of Experiment I. Here the interaction expected on the hypothesis that High-In Ss are more generally emotionally responsive than High-Ex's is conspicuously absent. In the pooled data of Experiments II and III, it is highly significant ($p = .001$); in the total pool, it is somewhat lower, but remains at a high level ($p < .005$). Individual F-tests of E-means only yielded an insignificant result in Experiment I, a probability beyond .005 in Experiments II and III, and beyond .01 in the total pool. Taken as a whole, then, the findings sustain the hypothesis, and are in agreement with the earlier findings of the pilot study. It is clear, however, that the data of Experiment I are somehow different; and that its inclusion in the total pool lowers the significance of the difference found.

The means reflecting response strength of High-In and High-Ex Ss on P (pleasant emotional) and U (unpleasant emotional) items are shown in Table 20.

Results of analyses of variance of these scores are shown in Tables 21, 22, and 23.

TABLE 20

RESPONSE STRENGTH OF HIGH-IN AND HIGH-EX Ss ON P (PLEASANT EMOTIONAL) AND U (UNPLEASANT EMOTIONAL) ITEMS

Experiment	High-In			High-Ex		
	(n)	P	U	(n)	P	U
I	(18)	12.2	16.3	(14)	13.8	15.3
II & III	(36)	15.9	16.1	(41)	11.2	12.2
I, II & III	(54)	14.6	16.1	(54)	11.9	13.0

TABLE 21

ANALYSIS OF VARIANCE OF P- AND U-SCORES OF HIGH-IN AND HIGH-EX GROUPS; EXPERIMENT I

Source	df	SS	MS	F	p
Between					
In-Ex	1	1.2	1.2	< 1.00	
Error (b)	30	2004.8	66.8		
Within					
P-U	1	138.1	138.1	1.29	
P-U x In-Ex	1	25.8	25.8	< 1.00	
Error (w)	30	3215.1	107.2		
Total	63	5385.0			

TABLE 22

ANALYSIS OF VARIANCE OF P- AND U-SCORES OF HIGH-IN AND HIGH-EX GROUPS, EXPERIMENTS II AND III

Source	df	SS	MS	F	p
Between					
In-Ex	1	700.7	700.7	9.51	<.005
Error (b)	75	5527.2	73.7		
Within					
P-U	1	16.8	16.8	< 1.00	
P-U x In-Ex	1	7.5	7.5	< 1.00	
Error (w)	75	6739.2	89.9		
Total	153	12991.4			

TABLE 23

ANALYSIS OF VARIANCE OF P- AND U-SCORES OF HIGH-IN AND HIGH-EX GROUPS; ALL THREE EXPERIMENTS

Source	df	SS	MS	F	p
Between					
In-Ex	1	465.3	465.3	6.36	< .025
Error (b)	106	7759.9	73.2		
Within					
P-U	1	92.1	92.1	< 1.00	
P-U x In-Ex	1	1.5	1.5	< 1.00	
Error (w)	106	9851.9	92.9		
Total	215	18170.7			

The only effect of significance in these three tables is that of In-Ex, which reaches the .005 level in tha data of Experiments II and III (Table 22), and drops to the .025 level in the total pool (Table 23). This is the expected effect on the hypothesis that High-In Ss should show superior response strength on both pleasant and unpleasant emotional items; the hypothesis, then, is confirmed, even though it is clear that Experiment I lowers the overall significance. The absence of any evidence of a differential effect on response strength of pleasant and unpleasant quality is even more marked than it was in the A groups analyses.

Conclusions that appear to be justified by the results of all these analyses are as follows. (1) Judging by relative response strength on emotional (pleasant plus unpleasant) items vs. nonemotional items, all Ss tend to be "generally emotionally responsive"; the relative superiority of E-items was significant beyond the .001 level in every analysis (including those based on Experiment I only). (2) However, there are group differences in general emotional responsiveness: High-A Ss are, to a not-quite-significant degree, less generally emotionally responsive than Low-A ($.10 > p > .05$); and High-In Ss are more generally emotionally responsive than High-Ex ($p < .005$). (3) "Specific emotional responsiveness," defined as the tendency to relatively over-respond either to "pleasant" or to "unpleasant" items, has no comparable over-all effect. Although the means for U-items are (except for High-A Ss) slightly higher, this tendency does not approach significance in any analysis. (4) There is, however, one significant group difference in specific emotional responsiveness: in the total pool, High-A Ss show less response strength than Low-A Ss on U-items, at the .05 level. Thus the findings with respect to general emotional responsiveness are consistent both with the results of earlier investigations and with prediction derived from Hullian theory; they also sustain the hypothesis of a relation between general emotional responsiveness and In-Ex. The hypothesis that there is a relation between "anxiety" and specific emotional responsiveness in the form of over-response to unpleasant stimuli only also appears to have support, but at a lower level of significance, and in an unexpected form: the direction of the relation found is opposite to prediction. Nevertheless, the data in general support the hypothesis of two types of emotional response mechanisms, one general, and one specific.

It remains to consider the confounding question, since the validity of these conclusions may be affected by it. The actual amount of statistical confounding in the experimental groups is shown in Tables 24 and 25.

TABLE 24

DISTRIBUTION OF R SCALE SCORES WITH RESPECT TO EXPERIMENTAL A GROUPS

	High-In (25-)	Midrange R (26-48)	High-Ex (49+)	Total
High-A (25+)	12 (8.0)	30 (30.5)	2 (5.5)	44
Low-A (5-)	4 (8.0)	31 (30.5)	9 (5.5)	44
Total	16	61	11	88

$X^2 = 8.46$, $p < .02$

Table 24 shows the frequency of High-In Ss in the High-A group and of High-Ex Ss in the Low-A group. Use of more extreme cut-off scores for

A groups has (unexpectedly) somewhat reduced these proportions from those found in Table 1; possibly this is simply a peculiarity of the present sample. Nevertheless the distribution still yields a significant chi-square ($p < .02$), so that confounding is theoretically possible. On the other hand it is worth noting that 73 per cent of High-A Ss are not High-In, and that 80 per cent of Low-A Ss are not High-Ex.

The frequencies of High-A Ss in the High-In group, and of Low-A Ss in the High-Ex group, are shown in Table 25. Here the distribution yields an even more significant chi-square ($p < .01$). But again, it is worth noting that a substantial majority (78 per cent) of High-In Ss are not High-A; and also that 83 per cent of High-Ex Ss are not Low-A.

TABLE 25

DISTRIBUTION OF A SCALE SCORES WITH RESPECT TO EXPERIMENTAL R GROUPS

	High-A (25+)	Midrange A (6-24)	Low-A (5-)	Total
High-In	12 (7.0)	39 (41.0)	3 (6)	54
High-Ex	2 (7.0)	43 (41.0)	9 (6)	54
Total	14	82	12	108

$X^2 = 10.34$, $p < .01$

Since both distributions yield significant chi-squares, confounding is theoretically present. The crucial question is therefore whether the results here reported may be reasonably explained in terms of confounding. The answer to this question is clearly negative. If similar results with a given dependent variable are obtained with two different scales, then it is reasonable to think the similarity may be due to what the scales have in common. But if different results are obtained, this cannot be due to what they have in common; it must be attributable to what they measure independently. That is the situation here. If High-In and High-A Ss had given similar results, e.g., both groups being high on "general emotional responsiveness" as compared with High-Ex and Low-A groups, then these similar relationships might well be interpretable in terms of the confounding in these groups. But the results of the theoretically confounded groups were in opposite directions. Presumably, then, they are interpretable in terms of the effects of the non-confounded majority. It would seem then that the conclusions stated above with regard to these results are not subject to the confounding question, and that they may stand as stated. To the extent that they are sound, the confounding empirically present should affect the results in the conservative direction.

DISCUSSION

The possibility that the highly significant difference in total incidental learning score between either Experiment I or Experiment II, and Experiment III, is due to error in timing the recall period of Experiment III cannot be absolutely ruled out, for only one experimenter was present. However, there were two procedural differences in the learning session of Experiment III which may have operated to depress these scores. One is that the session took place at night; in contrast, learning sessions in Experiments I and II were predominantly in the morning (fewer than 30 Ss took part in afternoon sessions, none at all at night). Thus Experiment III Ss may have been more tired, less alert. They may also have been a little resentful at having to give up some evening freedom to obtain required experimental points (with the exception of a small afternoon "make-up" for absentees, all other learning sessions took place during regular class period and required no surrender of free time); if so, their motivation may have been somewhat lower. Secondly, in Experiments I and II the incidental learning task was undertaken immediately, whereas in Experiment III it was preceded by work on two additional personality tests, one of which (the Cattell) consists of 187 items. Thus there is a clear possibility of proactive inhibition; and in fact there was some (not much) evidence in the recall lists of interference by Cattell items. Of course, such competing responses may have been considered and eliminated (a time-consuming procedure) by many of the Ss not giving objective evidence of them, but this must remain a hypothesis. A broader interpretation would account for the difference in terms of the depressing effects on motivation of fatigue (as a function both of time of day and of immediately preceding task) and (possibly) some degree of resentment. Which of these interpretations (error, proactive inhibition, lowered motivation), or which combination of them, is correct, is an interesting question. However, it does not appear to be directly relevant to the main body of the results. Whatever the cause or causes of the difference in total list length, there is no evidence that it (or they) altered relationships in Experiment III among the relevant variables (Tables 2 through 7).

On the other hand, there is some evidence (Table 6) that something in the procedure of Experiment I may have altered the relation between incidental learning and one of the personality variables (In-Ex as defined by R Scale score); there is also evidence (Tables 16, 17, and 18) that the relation between In-Ex and the dependent variables, E- and N-scores, is not the same in Experiment I. No evidence of an interaction between In-Ex and E-N was found here, although the interaction appeared at a very high level of significance in the remainder of the data. This interaction was also found in the latency scores of the pilot study (in which an intentional rather than an incidental learning task was employed). Thus in three of four studies the interaction appeared; only in Experiment I of this series is it missing. Experiment I procedure differed from all three of the others only in the anonymous condition of taking personality tests. This condition might well affect the set under which responses were made, and thus the validity (for prediction) of test scores. On the other hand, comparable evidence of an effect of this condition on the relation between

A Scale scores and other variables was not found (Tables 7, 11, and 15). On the contrary: where inclusion of Experiment I in the total pool lowered the significance of the In-Ex results, it enhanced the results with respect to A. The question is therefore why the anonymous condition (if this is the explanation) should have differentially affected the predictive validity of scores on the two tests. Many A scale items are, presumably, somewhat embarrassing to admit (e.g., "I have diarrhea once a month or more"); to the extent that these items indicate "anxiety," any condition enhancing frankness (as anonymity should) should increase the validity of scores. There does not seem to be anything intrinsically embarrassing about R Scale items; but to the extent that extraverted attitudes are more valued, extraverted responses would be socially preferable. At first blush, then, it appears that increased frankness would increase the predictive validity of these scores also. But this may not be true. Ruch (quoted in Ferguson, 7), using the introversion (B3I) scale of the Bernreuter Personality Inventory, found extraverts significantly more "dishonest" in their responses. It does not seem reasonable that there is any deliberate intent to deceive involved in this; rather, it is much more likely that the proverbially higher social interests and skills of extraverts are associated with habitual patterns of making socially preferable responses in social situations. Test conditions under which one may be identified as a person by the experimenter constitute a (moderately) social situation; anonymous conditions do not. Thus the anonymous condition may fail to tap a possibly significant aspect of extraversion, and so lower rather than increase the validity of "extravert" scores. On this view it is not the items themselves that best indicate extraversion (as A Scale items are assumed to indicate anxiety) but rather the assumption of a particular kind of response-set; the more extraverted the S, the stronger the set, and the more pervasive its effect on total score. It would seem to follow that the predictive validity of "introvert" scores would not be as much affected by the anonymous condition; and reference to Table 16 shows that the E- and N-scores of Experiment I High-In Ss are not very different from those of Experiments II and III, whereas the scores of High-Ex Ss are. Thus these means are consistent with this interpretation; but the interpretation itself must remain hypothetical.

The finding that all groups exhibit higher response strength on emotional than on nonemotional items is, as noted above, consistent with the results of earlier investigations with "affective" materials; and also predictable from Spence-Hull theory. From the theory, the equation $R = f(E) = f\ (H \times D)$ was assumed to represent the equation for the strength of an r_e conditioned to a word. This equation in turn leads to the prediction that the overt response strength on words which elicit conditioned r_e's should be higher than on words which do not. It is of interest now to examine more closely just what these components mean in this context, and how they may be supposed to make their contribution.

Take first the component D, generalized drive. A certain amount of D must theoretically underlie all the test responses, emotional and nonemotional. The question here is whether differences in D with respect to stimuli may be considered as contributing to the overall difference in response strength between emotional and nonemotional items; that is, whether higher D levels are associated with emotional items. There is an initial difficulty in this interpretation, if only because Ss with theoretically higher D (High-A Ss) contribute less to this superiority than those with lower D (Low-A Ss), at the $.10 > p > .05$ level. However, it is necessary to distinguish carefully between two aspects of D. Spence writes about D as a nonspecific, generalized, persisting state of arousal of the nervous system, involving factors intrinsic to the S which are (presumably) stable enough to allow inference as to D-level from score on a personality test. Over and above this, however, D also fluctuates with respect to external factors. Thus it may receive increments from specific r_e's whether these are autonomously generated or elicited by external stimuli. These two aspects may be regarded as "intrinsic" D and "extrinsic" D.* It is D as a function of external stimuli, extrinsic D, which is under discussion here, for these results are specific to stimuli and apply across Ss undifferentiated as to intrinsic D. Extrinsic D may easily receive increments from r_e's elicited by emotional words, and the overall superiority of response strength of emotional words may be interpreted in this way. A corollary is, of course, that the extent of the increment in extrinsic D associated with a particular item is a function of the intensity of the r_e which it elicits. This interpretation of this part of the results leads to some interesting inferences. The first is that extrinsic D receives increments from pleasant as well as from aversive r_e's. The second is that intrinsic D, as defined by MAS score, is apparently negatively related to increments in extrinsic D as a function of r_e's elicited; some sort of interference is implied.

The next question is the possible contribution of H, habit strength, to the difference. It is here assumed that H as a function of number of reinforced occurrences of the response is equal or random, since reinforcement is difficult to define in the learning of word meanings, and since the meanings of all items (both emotional and nonemotional) are already overlearned for speakers of English.* As Spence, Haggard, and Ross (35) have shown, however, there may be increments in H over and above the number of reinforced occurrences, as a function of intensity of UCS's during learning. It is conceivable that the H's of emotional words may be higher as a result of this. It is clear, however, that "intensity of UCS" cannot be defined conventionally in this context. The conventional definition is concerned with physical energies. But there is no one-to-one relation between physical intensities and word meanings. Take, for example, the phrase "unloved child." If this is "emotional" it may have this association either as the result of painful spankings and loud tones, or of withdrawal of physical contact and silence, or both. Similarly, the phrase "Liberty . . . or death" is unlikely to be "emotional" merely because of the noise of firecrackers on the Fourth of July; it is more likely to be so as the result of education, i.e., its emotional quality is built on a network of other word-meanings, which are themselves without one-to-one physical energy correlates. In short, the common ground here is not the physical intensities of the associated stimuli during the course of learning meaning; it is the capacity of these stimuli (whether physically intense or not) to elicit emotional responses. Accordingly, "intensity of UCS" must here be defined as intensity of r_e's during learning. It follows that an emotional response, conditioned or not, may function as an unconditioned stimulus. It should be noted that this definition of "intensity of UCS," although unconventional, is not inconsistent with Spence theory. For in another paper (31), Spence interprets the effects of intensity of UCS (conventionally defined) in terms of the r_e's elicited.

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*It is recognized that the term "intrinsic motivation" historically has another meaning. Unfortunately, apt alternatives without similar or other objections do not seem available.

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*There was one exception. Several Ss inquired about the meaning of "vivisection." No other item elicited queries except from a Korean S who was discarded.

The component V, conventionally defined as physical intensity of the conditioned stimulus, has no application in this context. For it is clear that words are conditioned stimuli, and that they are in themselves without physical intensities. On the other hand their (perceived) intensities do vary, as evidenced by variations in rating. V in this context may therefore be thought of as perceived intensity, operationally defined by ratings on a 5-point scale. The highly significant difference between 1 (emotional) and 5 (nonemotional) ratings would then be straightforwardly interpretable in terms of the difference between (perceived) V's. But what underlies the perceived intensity difference? V, defined as intensity of CS, is theoretically correlated with V_1, intensity of the "molar stimulus trace," that is, intensity of the internal response to the CS. The hypothetical identification of V_1 with r_e when the S has been asked to rate for "emotional" intensity seems a straightforward inference. It has some support in the reliable relation (noted by McCurdy, 20) between emotional intensity ratings and magnitude of PGR, insofar as PGR reflects r_e. According to Woodworth and Schlosberg (43), PGR is a good indicator of emotion regarded as activation (as Spence regards it).

Thus the contributions of the components D, H, and V to the generally superior response strength of emotional items all seem traceable to a single factor, intensity of r_e. Therefore group differences in response strength to emotional stimuli are presumably dependent on variations in the intensity of r_e. By analogy with overt reflexes, magnitude of r_e is assumed by Spence to vary with (1) adaptation, (2) intensity of eliciting stimulus, and (3) individual differences in emotional responsiveness. Intensity of eliciting stimuli has already been shown to be in this case a function of internal ("perceived") factors; externally the words on the list are identical for all Ss. Degree of adaptation to stimuli eliciting r_e is itself an index of emotional responsiveness, since the two are assumed to be negatively correlated (cf. Spence, 29, p. 183). Group differences in response strength on emotional items must therefore be a function of variations in r_e due to individual differences in emotional responsiveness (general or specific).

A distinction was made above between two hypothetical aspects of D: intrinsic D, inferrable from MAS score, and extrinsic D, a function of external stimuli. It was shown that the overall superiority in response strength of emotional stimuli is an indication that all groups of Ss are generally emotionally responsive; also that these findings can be interpreted in terms of extrinsic D (as well as in terms of H or V). On the other hand, the A-groups difference makes it quite clear that intrinsic D does not contribute positively to general emotional responsiveness. On the contrary, some sort of interference is implied by the results. When response strength to pleasant and unpleasant emotional items is compared, it becomes apparent that this "interference" is limited to the unpleasant items, where its effect is significant at the .05 level. This is an effect which is specific with respect to hedonic quality; there is no difference in the response strength of High-A and Low-A Ss to pleasant items. To that extent, then, it is consistent with the hypothesis of specific emotional responsiveness. On the other hand the effect is opposite in direction to that predicted. Nevertheless, this outcome seems reasonably deducible from the hypothesis; its possibility ought therefore to have been foreseen. If it is assumed that High-A Ss are specifically over-responsive to aversive stimuli (both intrinsic and extrinsic) then two consequences follow: (a) higher generalized D as a function both of intrinsic and extrinsic aversive stimuli; and (b) higher H of avoidance responses to aversive extrinsic stimuli (as a function of intensity of elicited r_e's, serving as UCS's). Combination of these factors in the equation $E = f\ (H \times D)$ leads to the conclusion that the excitatory potential of the avoidance response to a given aversive external stimulus should be higher for High-A than for Low-A Ss. Note, however, that this chain of reasoning collapses unless specific emotional responsiveness is assumed. Without this assumption, the results appear to have no reasonable interpretation. Thus the hypothesis of specific emotional responsiveness, as related to A Scale scores, appears to be supported even though the findings were opposite in direction to that predicted.

Similarly, the results with the In-Ex groups appear to sustain the hypothesis of a second emotional response mechanism, differing from the first in that it involves relative over-response to any kind of emotional stimulus, pleasant or aversive, and here called general emotional responsiveness. In accordance with the hypothesized relation between general emotional responsiveness and introversion, High-In Ss appear to be more generally emotionally responsive than High-Ex Ss at a high significance level. This is true whether the comparison is of general emotional items (E-scores) or of specific emotional items (P- and U-scores). The outcome accords well both with the initial deduction from Eysenck's excitation-inhibition theory, and with the Jungian view (15) that introverts are more attentive to internal stimuli, which directly implies a higher intensity of (perceived) V's for introverts.

This part of the results also affords a theoretical basis for the observed confounding between High-In and High-A groups; general emotional responsiveness and specific emotional responsiveness coincide, have common ground, in over-response to aversive stimuli.

It is reassuring to find that Eysenck has himself recently come to conclusions which, although stated in different language, appear entirely consistent with those stated above. The following quotations are from his most recent publication (5):

> The hypothesis of genuine interaction effects between introversion and neuroticism should not be disregarded. There may be a point in the conditionability, which in theory characterizes the introvert, where fear responses [aversive r_e's in the present context] are acquired at a rate and at a strength which exceeds the strength of the normal extinction processes; this point may delimit a region of positive feedback which could be responsible for the interaction . . . .
>
> Perhaps the most likely reason for the correlation between introversion and neuroticism among high-scoring subjects is one which can be deduced from the general theory of extraversion, according to which cortical inhibition is stronger in extraverts than in introverts. This principle applies to all sensory inputs, proprioceptive as well as exteroceptive; it seems likely therefore that the perception of autonomic activity characteristic of emotion is equally subject to such inhibition.

Accordingly, the results support the postulation of two separate emotional response mechanisms, empirically different in their effects. They indicate that there is a moderately significant relation between the specific factor and A Scale scores; and a highly significant relation between the general factor and R Scale scores. Since the general factor theoretically presupposes "pleasant" r_e's (and the results are consistent with the presupposition) several implications follow. The results suggest that new definitions may be needed. First, they imply that the term "emotional responsiveness" should not be narrowly defined (as it is by Spence and Eysenck) as "responsiveness to aversive stimuli"; and as a corollary, that the term r_e might well stand for this expanded definition, with subdivisions r_a (aversive r_e) and r_p (pleasant r_e). Ss might then be characterized as high in one respect, or the other, or both, and the accuracy of prediction enhanced. The present results in no way support unqualified application of the term "emotionally responsive" to High-A Ss, as is currently done, and this illustrates the need for redefinition.

SUMMARY

1. A series of studies testing a hypothesis that there are two emotional response mechanisms was carried out. Specific emotional responsiveness (over-response to aversive stimuli) was hypothesized as related to "anxiety"; and general emotional responsiveness (over-response to both pleasant and aversive emotional stimuli) to introversion.

2. Ss rated 105 verbal items for emotional intensity on a 5-point scale; later they also designated the items as pleasant, unpleasant, or neutral. Their incidental recall of the items was then tested.

3. Response strength of the experimental groups to items rated 1 (general emotional) and 5 (nonemotional); and to items rated 1-P (pleasant emotional) and 1-N (unpleasant emotional) was inferred from ratios of observed to expected frequencies in the recall lists.

4. General emotional items were better retained than nonemotional items, groups disregarded, at the .001 level. There was no significant overall difference in retention of pleasant and unpleasant emotional items.

5. Introverts as compared with extraverts showed superior retention of general emotional items at the .005 level, and of both pleasant and unpleasant emotional items at beyond .025. High-A as compared with Low-A Ss showed inferior retention of general emotional items at the $.10 > p > .05$ level; there was no difference between these groups on pleasant emotional items, but High-A Ss recalled fewer of the unpleasant items at the .05 level.

6. It was concluded that the hypotheses were sustained. The results were discussed in terms of Hull's equation $R = f(E) = f\ (H \times D \times V)$.

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APPENDIX I

Feeling Scale

Directions: This test is a study of personality patterns, and there are, of course, no "right" or "wrong" answers, for each individual is different.

Below you will find a list of phrases referring to different kinds of ideas, objects, issues, experiences, etc. Please rate each phrase for the amount of feeling you usually have about what it refers to. Circle 1 for "extremely strong feeling," 2 for "strong feeling," 3 for "moderate feeling," 4 for "little feeling," and 5 for "no feeling" or complete indifference.

"Feeling" is intended to mean things like approval, enjoyment, sense of beauty, anger, disgust, sympathy, sadness, fear, and so on - in fact, *any kind* of feeling which you might have. However, you are not asked to indicate the *kind* of feeling, only the *amount*. For instance, you might feel strongly about something either because you enjoyed it very much or because you hated it. In either case you would select a rating of 1 or 2, depending on how strongly you felt about it.

Do not think too long about any one item. Use your first impression. Please work as quickly and accurately as you can.

1. Modern art 1 2 3 4 5
2. Stained glass windows 1 2 3 4 5
3. Mist in the morning 1 2 3 4 5
4. Spitting in public places 1 2 3 4 5
5. A jar of tapeworms 1 2 3 4 5
6. Big flakes of snow 1 2 3 4 5
7. Sand crystals 1 2 3 4 5
8. Flat country 1 2 3 4 5
9. Cattle grazing 1 2 3 4 5
10. Mountain tops at sunrise 1 2 3 4 5
11. Ocean tides 1 2 3 4 5
12. A slaughter house 1 2 3 4 5
13. An old red barn 1 2 3 4 5
14. A mongrel puppy 1 2 3 4 5
15. A Beethoven symphony 1 2 3 4 5
16. Tropical fish 1 2 3 4 5
17. Porpoises at play 1 2 3 4 5
18. A sailing ship 1 2 3 4 5
19. A gray row boat 1 2 3 4 5
20. Brown slime 1 2 3 4 5
21. Hairy spider legs 1 2 3 4 5
22. A good joke 1 2 3 4 5
23. A lecture on economics 1 2 3 4 5
24. A pair of galoshes 1 2 3 4 5
25. Dishwashing detergents 1 2 3 4 5
26. Dust mops 1 2 3 4 5
27. American Cancer Society 1 2 3 4 5
28. Boys' Town 1 2 3 4 5

29. Juvenile delinquency 1 2 3 4 5
30. White Citizens Councils 1 2 3 4 5
31. Racial intermarriage 1 2 3 4 5
32. The weather news 1 2 3 4 5
33. Westerns on TV 1 2 3 4 5
34. A dental appointment 1 2 3 4 5
35. Scientific agriculture 1 2 3 4 5
36. The kickoff 1 2 3 4 5
37. Touchdown by opponents 1 2 3 4 5
38. Racing cars 1 2 3 4 5
39. The missile lag 1 2 3 4 5
40. Outer space 1 2 3 4 5
41. Vitamin pills 1 2 3 4 5
42. Burning leaves 1 2 3 4 5
43. The Honor System 1 2 3 4 5
44. A gray suit 1 2 3 4 5
45. Seeing an animal mistreated1 2 3 4 5
46. Vivisection 1 2 3 4 5
47. Sugar substitutes 1 2 3 4 5
48. Reducing diets 1 2 3 4 5
49. Sunday blue laws 1 2 3 4 5
50. Censorship 1 2 3 4 5
51. Whole wheat cereals 1 2 3 4 5
52. A good athlete 1 2 3 4 5
53. High scholarship 1 2 3 4 5
54. Passing grades 1 2 3 4 5
55. Another person's heartbreak 1 2 3 4 5
56. Another person's embarrassment 1 2 3 4 5
57. Straight chairs 1 2 3 4 5
58. Spanish moss 1 2 3 4 5
59. Dictatorships more efficient1 2 3 4 5
60. The USSR 1 2 3 4 5
61. The proud republic 1 2 3 4 5
62. The Four Freedoms 1 2 3 4 5
63. Unemployment insurance 1 2 3 4 5
64. Electric clocks 1 2 3 4 5
65. Integrated schools 1 2 3 4 5
66. Compound interest 1 2 3 4 5
67. Junk yards 1 2 3 4 5
68. "We hold these truths..." 1 2 3 4 5
69. "Liberty . . . or death" 1 2 3 4 5
70. The Bill of Rights 1 2 3 4 5
71. Self-determination 1 2 3 4 5
72. Dignity of man 1 2 3 4 5
73. "We will bury you" 1 2 3 4 5
74. Separate but equal 1 2 3 4 5
75. Might makes right 1 2 3 4 5
76. The multiplication table 1 2 3 4 5
77. Final exams 1 2 3 4 5
78. Buying text books 1 2 3 4 5
79. Race equality 1 2 3 4 5
80. Modern architecture 1 2 3 4 5

81. A good housekeeper 1 2 3 4 5
82. Being for the underdog 1 2 3 4 5
83. Being an idealist 1 2 3 4 5
84. Writing term papers 1 2 3 4 5
85. A good sermon 1 2 3 4 5
86. A blind date 1 2 3 4 5
87. A good cold beer 1 2 3 4 5
88. Skin diving 1 2 3 4 5
89. Crucifixion and resurrection 1 2 3 4 5
90. Motor scooters and motorcycles 1 2 3 4 5
91. Microscopic forms of life 1 2 3 4 5
92. Extrasensory perception 1 2 3 4 5
93. Ancestral portraits 1 2 3 4 5
94. Killing for pleasure 1 2 3 4 5
95. The World Series 1 2 3 4 5
96. The beat generation 1 2 3 4 5
97. A lonely old person 1 2 3 4 5
98. An unloved child 1 2 3 4 5
99. Cat playing with a mouse 1 2 3 4 5
100. Dead dog on the highway 1 2 3 4 5
101. An eyeless person 1 2 3 4 5
102. Whipping an animal 1 2 3 4 5
103. Kittens on a trash heap 1 2 3 4 5
104. Someone being ridiculed 1 2 3 4 5
105. Male superiority 1 2 3 4 5

APPENDIX II

TABLE 26

SCORES AND FREQUENCIES OF RATINGS[a] OF Ss[b] IN EXPERIMENTAL GROUPS

Subject	Experiment	R Scale	A Scale	Ratings				Recall Scores	Ratio Scores			
				1	1P	1U	5		1	1P	1U	5
				High-Introvert Ss								
1	I	19	6	5	1	4	32	29	22	0	27	10
2	I	22	29	10	6	4	10	22	19	24	16	14
3	I	24	7	3	2	1	48	21	16	0	50	8
4	I	20	11	12	5	12	48	27	3	0	6	8
5	I	17	17	40	19	21	11	27	14	14	13	0
6	I	25	14	22	10	12	11	21	18	25	12	0
7	I	24	10	19	10	7	12	37	18	17	12	7
8	I	18	20	19	6	13	3	11	5	0	7	31
9	I	25	13	17	15	1	27	30	15	14	0	9
10	I	19	23	47	22	25	4	26	14	16	11	0
11	I	23	24	3	2	1	22	33	21	16	31	7
12	I	12	24	26	11	15	17	22	18	13	22	3
13	I	22	21	31	19	10	17	27	11	14	4	9
14	I	22	22	35	19	15	13	20	20	19	24	14
15	I	25	40	26	2	24	15	3	27	0	29	0
16	I	18	41	21	14	7	24	39	17	16	18	8
17	I	20	33	38	5	2	35	19	14	22	0	13
18	I	22	28	19	5	13	17	21	11	10	11	15
19	II	16	17	11	4	7	0	19	26	29	25	0[c]
20	II	23	8	5	4	1	14	21	10	12	0	11
21	II	25	11	13	2	11	5	45	9	23	6	9
22	II	18	22	13	1	12	0	35	21	25	21	4[c]
23	II	23	9	7	0	7	2	30	15	0	15	35
24	II	25	8	7	5	2	15	29	21	23	17	14
25	II	23	8	10	7	3	11	36	12	12	10	3
26	II	19	8	3	2	1	12	26	13	0	40	6
27	II	24	7	0	9[d]	2[d]	4	28	11[d]	9[d]	20[d]	4
28	II	9	15	10	3	6	7	37	17	20	19	12
29	II	20	12	0	12[d]	12[d]	7	12[d]	10[d]	14[d]	7	0
30	II	21	24	36	14	22	3	34	13	11	14	10
31	II	21	10	30	19	9	12	35	14	11	20	8
32	II	23	20	5	3	2	20	17	24	20	30	0
33	II	12	14	5	1	4	36	26	8	0	10	1
34	II	12	13	18	7	11	4	30	20	20	19	0
35	II	17	9	10	6	4	8	37	14	10	21	7
36	II	21	12	14	6	8	23	37	15	14	15	6
37	II	19	23	8	5	3	22	44	12	20	0	6
38	II	17	24	11	4	7	1	29	21	20	21	0
39	II	18	25	27	11	16	17	46	13	16	11	5
40	II	24	27	38	16	20	21	28	17	12	22	5

TABLE 26--Continued

Subject	Experiment	R Scale	A Scale	Ratings				Recall Scores	Ratio Scores			
				1	1P	1U	5		1	1P	1U	5
41	II	21	39	12	6	6	17	33	16	21	5	13
42	II	21	27	21	14	7	23	22	18	21	13	8
43	II	13	30	9	4	5	3	34	31	31	30	0
44	II	16	31	14	13	1	17	34	11	12	0	9
45	II	25	0	4	3	1	5	31	34	34	33	20
46	II	23	5	18	8	10	12	36	11	15	9	2
47	III	17	18	13	3	10	5	27	18	39	12	23
48	III	25	11	48	26	22	9	22	10	11	8	15
49	III	17	22	22	9	13	7	18	19	6	27	8
50	III	19	22	44	20	22	17	17	11	9	15	11
51	III	23	24	25	12	13	10	22	13	12	15	5
52	III	24	25	14	4	10	16	27	16	20	15	5
53	III	24	4	12	9	3	19	26	15	19	0	4
54	III	24	8	2	0	2	12	16	33	0	33	20
					High-Extraverts							
55	I	54	3	42	28	14	17	35	13	13	13	7
56	I	56	6	17	14	3	7	27	18	17	25	6
57	I	62	7	16	9	7	28	35	17	17	17	9
58	I	60	7	52	30	21	6	26	13	14	12	2
59	I	57	6	48	26	22	5	33	13	13	13	6
60	I	63	17	24	17	6	26	29	14	13	20	4
61	I	51	12	14	4	6	12	24	25	33	22	4
62	I	55	16	43	19	15	21	21	15	3	28	7
63	I	51	12	18	15	3	2	30	8	7	11	18
64	I	57	14	41	21	19	16	26	16	15	15	3
65	I	50	22	35	20	15	13	31	13	10	16	8
66	I	50	12	11	8	3	10	24	16	16	0	18
67	I	49	17	33	12	21	13	31	11	14	10	5
68	II	56	2	0	3[d]	14[d]	0	33	9[d]	31[d]	8[d]	9[c]
69	II	51	4	9	1	8	5	37	10	0	11	6
70	II	52	4	38	22	16	10	30	9	7	12	10
71	II	73	4	25	4	21	17	43	7	6	8	7
72	II	51	5	42	27	15	7	37	13	13	12	16
73	II	55	13	3	0	3	7	35	0	0	0	13
74	II	55	8	22	10	12	4	61	9	10	7	4
75	II	60	10	5	3	2	1	27	15	26	0	0
76	II	56	6	35	15	20	24	25	14	8	19	7
77	II	54	23	34	14	15	31	23	9	10	12	13
78	II	52	20	8	7	1	21	29	18	24	0	14
79	II	60	14	30	15	11	26	33	13	14	8	5
80	II	49	19	26	13	9	3	17	9	10	12	0
81	II	49	11	5	3	2	27	33	13	10	16	7

TABLE 26--Continued

Sub-ject	Exper-iment	R Scale	A Scale	Ratings				Recall Scores	Ratio Scores			
				1	1P	1U	5		1	1P	1U	5
82	II	66	11	30	16	14	18	22	11	18	3	16
83	II	63	18	0	2[d]	10[d]	12	35	18[d]	0[d]	21[d]	13
84	II	59	13	27	7	20	4	24	15	12	15	0
85	II	56	13	9	5	4	14	26	13	24	0	14
86	II	51	12	56	29	25	8	26	12	12	11	5
87	II	50	16	39	15	24	23	38	8	2	13	12
88	III	51	19	17	12	5	2	17	18	10	37	31
89	III	50	11	29	13	15	19	10	7	8	0	28
90	III	50	10	12	7	5	15	14	25	22	30	9
91	III	51	12	44	25	19	4	32	10	9	10	25
92	III	49	21	6	1	5	6	14	12	0	15	38
93	III	54	11	40	23	17	15	13	12	7	19	6
94	III	59	12	55	28	27	9	30	9	8	10	19
95	III	58	9	9	9	0	54	27	9	9	0	12
96	III	59	8	61	37	24	6	16	11	12	9	0
97	III	60	16	50	19	13	20	22	12	11	10	5
98	III	61	18	35	19	15	5	26	13	13	13	8
99	III	56	15	59	32	27	4	30	12	11	13	7
100	III	52	29	9	6	3	3	30	16	17	12	0
101	III	59	32	22	15	7	7	22	13	7	23	20
102	III	53	22	39	20	15	0	10	22	26	14	7[c]
103	III	49	19	35	28	7	27	29	8	9	5	17
104	III	52	10	39	17	17	6	24	8	0	13	15
105	III	53	13	3	0	3	20	16	22	0	22	33
106	III	56	4	42	30	7	5	25	12	11	18	21
107	III	50	5	5	3	2	3	25	25	14	40	28
108	III	50	5	15	12	3	4	14	15	19	0	19
					High-A							
2	I	22	29	10	6	4	10	22	19	24	16	14
15	I	25	40	26	2	24	15	3	27	0	29	0
16	I	18	41	21	14	7	24	39	17	16	18	8
17	I	20	33	8	5	2	35	19	14	22	0	13
18	I	22	28	19	5	13	17	21	11	10	11	15
109	I	43	31	36	14	22	0	35	12	13	12	3[c]
110	I	29	28	9	3	6	13	31	30	33	28	8
111	I	29	25	34	22	12	16	39	14	15	9	3
112	I	46	32	25	15	10	5	34	13	12	15	0
113	I	44	29	43	24	19	4	47	12	12	11	11
114	I	45	25	3	1	2	23	24	0	0	0	6
115	I	42	34	20	10	10	8	30	18	14	21	18
116	I	29	25	14	14	0	23	14	27	27	0	6
117	I	27	26	39	21	18	2	29	12	10	16	0

TABLE 26--Continued

Sub-ject	Exper-iment	R Scale	A Scale	Ratings 1	Ratings 1P	Ratings 1U	Ratings 5	Recall Scores	Ratio Scores 1	Ratio Scores 1P	Ratio Scores 1U	Ratio Scores 5
118	I	33	40	38	26	12	13	18	12	11	14	18
119	I	43	29	18	6	12	38	33	12	16	11	9
120	I	31	34	32	9	18	26	21	8	6	6	12
39	II	18	25	27	11	16	17	46	13	16	11	5
40	II	24	27	38	16	20	21	28	17	12	22	5
41	II	21	39	12	6	6	17	33	16	21	5	13
42	II	21	27	21	14	7	23	22	18	21	13	8
43	II	13	30	9	4	5	3	34	31	31	30	0
44	II	16	31	14	13	1	17	34	11	12	0	9
121	II	39	30	45	23	22	19	11	8	9	8	0
122	II	32	25	43	25	18	26	35	10	10	12	12
123	II	36	31	51	22	29	30	35	15	11	19	4
124	II	36	34	46	18	28	20	22	13	11	15	10
125	II	29	33	34	23	11	45	31	10	12	6	10
126	II	33	26	31	24	7	22	26	12	10	15	7
127	II	28	26	6	2	4	10	24	22	22	22	4
128	II	26	29	38	17	21	22	16	17	19	16	12
129	II	28	25	40	19	21	11	15	14	19	10	19
130	II	37	31	20	8	12	12	40	14	17	13	15
131	II	34	27	6	3	3	28	20	9	0	18	8
132	II	39	35	20	5	15	13	30	14	7	15	6
133	II	43	26	13	5	8	13	14	12	15	9	6
134	II	44	26	27	12	15	4	51	14	19	13	10
135	II	46	26	32	13	19	24	21	9	0	16	6
52	III	24	25	14	4	10	16	27	16	20	15	15
100	III	52	29	9	6	3	3	30	16	17	12	0
101	III	59	32	22	15	7	7	22	13	7	23	20
136	III	45	34	4	1	3	27	29	27	36	24	5
137	III	40	27	30	17	13	2	22	12	8	18	0
138	III	30	34	43	29	14	11	13	15	14	18	0
					Low-A							
1	I	19	6	5	1	4	32	29	22	0	27	10
55	I	54	3	42	28	14	17	35	13	13	13	7
139	I	41	2	13	3	10	18	17	4	0	5	10
140	I	40	1	16	8	8	4	21	19	12	35	0
141	I	41	4	30	13	17	7	39	14	15	14	8
142	I	47	5	37	18	16	11	36	13	13	13	8
143	I	39	4	21	6	15	11	29	12	18	10	7
45	II	25	0	4	3	1	5	31	34	34	33	20
46	II	23	5	18	8	10	12	36	11	15	9	2
68	II	56	2	0	3[d]	14[d]	0	33	9[d]	31[d]	8[d]	9[c]
69	II	51	4	9	1	8	5	37	10	0	11	6

TABLE 26--Continued

Sub- ject	Exper- iment	R Scale	A Scale	Ratings				Recall Scores	Ratio Scores			
				1	1P	1U	5		1	1P	1U	5
70	II	52	4	38	22	16	10	30	9	7	12	10
71	II	73	4	25	4	21	17	43	7	6	8	7
72	II	51	5	42	27	15	7	37	13	13	12	16
144	II	42	5	6	4	2	8	16	44	33	67	8
145	II	40	2	9	5	4	18	20	29	32	26	6
146	II	42	0	21	12	9	6	32	16	19	11	11
147	II	31	5	26	15	11	50	16	13	9	18	10
148	II	32	3	19	14	5	1	22	23	20	29	50
149	II	31	4	16	9	7	21	41	19	20	18	10
150	II	32	5	14	7	7	18	19	16	24	8	6
151	II	47	2	10	6	4	6	38	22	18	28	14
152	II	33	5	27	11	16	15	35	17	14	19	10
153	II	34	5	0	0[d]	1[d]	45	19	0[d]	0[d]	0[d]	9
154	II	44	3	25	9	16	20	22	13	18	11	12
155	II	36	5	23	10	13	22	21	13	10	15	4
156	II	38	3	1	0	1	25	18	58	0	58	2
157	II	46	3	1	0	1	60	37	29	0	29	8
158	II	39	4	25	9	16	13	29	16	32	7	11
159	II	47	5	13	8	5	15	24	17	16	18	6
160	II	38	4	5	1	4	5	31	7	0	10	7
161	II	44	4	24	13	11	21	25	14	13	15	4
162	II	42	5	14	5	9	11	28	19	15	21	3
53	III	24	4	12	9	3	19	26	15	19	0	4
106	III	56	4	42	30	7	5	25	12	11	18	21
107	III	50	5	5	3	2	3	25	25	14	40	28
108	III	50	5	15	12	3	4	14	15	19	0	19
163	III	31	6	6	3	3	16	29	24	24	24	9
164	III	32	4	41	23	19	2	17	17	16	17	0
165	III	41	5	2	0	2	13	19	28	0	28	8
166	III	33	2	24	13	6	11	12	15	15	15	8
167	III	39	4	3	0	3	21	20	18	0	18	10
168	III	46	2	15	8	7	39	20	7	7	6	9
169	III	48	2	3	2	1	7	23	45	45	43	4

[a] In some cases the sum of 1P and 1U does not equal 1. The discrepancies are due to the fact that some Ss assigned a neutral (-) rating to some of their 1 ratings.

[b] Some Ss are included in both introversion and anxiety experimental groups.

[c] Based on 4 ratings.

[d] Based on 2 ratings.

BIOGRAPHICAL SKETCH

Winnifred Moon Nielsen was born August 16, 1917, in Key West, Florida. She was graduated from Central High School, Manila, Philippine Islands, in April, 1934. She attended the University of Wyoming in 1936, and Columbia University for one semester (Spring, 1954). From September, 1954, to June, 1956, she worked as a research assistant at the Parapsychology Laboratory, Duke University. In June, 1956, she entered the University of Florida, from which she received the degree of Bachelor of Arts with honors in 1958; and in September, 1958, she enrolled in the Graduate School of the University of Florida. From 1958 to 1960 she held graduate fellowships, and since 1960 has been employed as a graduate assistant in the Department of Psychology. In 1960 she was awarded the degree of Master of Arts, and since that time has worked toward the degree Doctor of Philosophy.

Mrs. Nielsen has been married twice: to Major Kenneth Smith, killed in action in 1943; and to William Andrew Nielsen, killed in an accident in 1953. She has three children: Cynthia Smith Clausen (Mrs. Carl Clausen), a 1960 graduate of the University of Florida; Kenneth Smith, a midshipman at the United States Naval Academy, Annapolis, Maryland; and Jennifer Nielsen, a Gainesville High School student. Mrs. Nielsen is a member of Phi Kappa Phi, Phi Beta Kappa, and Sigma Xi.

This dissertation was prepared under the direction of the chairman of the candidate's supervisory committee and has been approved by all members of that committee. It was submitted to the Dean of the College of Arts and Sciences and to the Graduate Council, and was approved as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

August 11, 1962.

Stan E. Wimberly
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Dean, Graduate School

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